

REMARKS

Claims 1, 3, 6, and 7, are currently amended; claims 2, 4, and 10-20 are canceled and new claims 21-33 are presented. Hence, claims 1, 3, 5-9 and 21-33 are now pending.

The Applicants have carefully considered the Office Action of February 6, 2009 respectfully traverse the rejections set forth therein. Reconsideration and withdrawal of these rejections in view of the following remarks are respectfully requested.

Explanation of the Amendments

Claims 1, 3, 6, and 7 as amended, now limit the soluble copper salt to being divalent and is selected from copper nitrate, copper sulfate and copper acetate. This amendment better defines the invention and enables the claims to better conform to the working examples provided in the specification. Basis for the amendment is found in the specification on pages 9 and in the Examples.

As the foregoing claim amendments add no "New matter" to the application and also place the application in better condition for allowance/appeal, Applicants request that such amendments be entered into the record for further examination.

Examiner Interview

Participants: Laura Martin, Manesh Shah, Greg Feulner, Christian Jackson, Dennis Morrell, and Simon Xu

It was agreed that separating Claim 1 into three independent claims would better describe the invention(s) and make evaluation of the claims easier. Thus, Claim 1 has been split into three independent claims

1. A soluble polymer binder
2. A calcium salt
3. A combination of a soluble polymer binder and a calcium salt

Obviousness Rejections 35 U.S.C. §103

In the previous Office Action, all the claims were rejected under 35 U.S.C. §103(a) as allegedly being obvious and unpatentable over the disclosure of Osumi et al (US6375317) in view of Katsuragi et al (EP1125994) or in view of this combination of references further in view of one or more of Vue et al. (US 6461418), Suzuki et al. (US 6153001), and Katsuragi et al. (EP 1191077). Applicants respectfully traverse this Final rejection.

Obviousness Rejection 1

Claims 1, 4-8, 10 and 16-19 stand rejected as allegedly being obvious over the disclosure of Osumi et al (US6375317) in view of Katsuragi et al (EP1125994). Claims 10-19 have been withdrawn.

Osumi et al (US6375317), as the closest prior art, as suggested by the Examiner, at most, this reference can only be considered as teaching within its broad disclosure an ink set comprising a first ink, comprising a self-dispersing pigment (SDP), and a calcium salt in the first ink. The secondary reference is Katsuragi et al (EP1125994), at most, this reference can only be considered as teaching within its broad disclosure an ink set comprising a first ink, comprising a self-dispersing pigment (SDP), and a fixing fluid, comprising a polyvalent metal salt of a glyconic acid. The polyvalent metal salts of the glyconic acid for the fixing fluid specifically named therein are magnesium, calcium, barium, iron, copper and zinc. Of these, calcium and magnesium are listed as most preferred [0049] and are the only polyvalent metal fixers of glyconic acid exemplified.

What was discovered by Applicants, contrary to expectation, is that the multivalent metals are not equivalent as fixers for an ink comprising SDP when that ink further comprises a soluble polymer binder or/and an effective amount of calcium cation. Fixers with copper nitrate, copper sulfate, or copper acetate gave surprising, unpredictable, and unexpectedly superior OD results compared to fixers with calcium and other metals when used with a first ink comprising SDP and a soluble polymer binder or/and an effective amount of calcium cation. These unexpected results, which are demonstrated in Applicants' specification, are stressed in that the superior performance of the copper fixer in combination with an SDP ink containing soluble polymer binder and/or calcium cation is of significant magnitude, and practical importance as it results in a visually perceptible increase in OD and consequently better image quality.

In Example 3 of the specification (See Table after paragraph [0127]), Ink B (self-dispersing pigment with soluble polymer binder) paired with the copper-nitrate containing fixer D1 achieved significantly and surprisingly superior optical density at a lower area fill of the fixing fluid than the same ink paired with other fixers including calcium-containing fixer F1. The ability to use lower area fill of fixing fluid is advantageous because it imposes less liquid load on the substrate. At fixer fills greater than 75%, paper curl was severe.

In Example 6 of the specification (See Table after paragraph [0134]), inks L2-L4 (self-dispersing pigment with multivalent metal salt) paired with the copper nitrate fixer D1 gave better optical density than similar ink (Ink L 1, no salt) paired with D1. Especially advantageous is the pairing of Ink L2 (with added calcium salt) and copper nitrate fixer D1 which gave surprisingly superior optical density than the same ink fixed with calcium nitrate fixer A1. Similarly, an ink comprising self-dispersing pigment and both soluble binder and calcium salt (Ink M) paired with copper nitrate fixer D1 gave surprisingly superior optical density when compared to the same ink fixed with calcium nitrate fixer A1.

Since all of the claims require that a copper nitrate, copper sulfate, or copper acetate containing fixer fluid be used with the first ink comprising an SDP and a soluble polymer binder or/and calcium cation, they are clearly commensurate in scope with the unexpected results shown in the specification.

Based on these arguments above Obviousness Rejection 1 should be overcome for claim 1 and claims 5-9 which are dependent on claim 1.

Obviousness Rejection 2

Claims 3, and 15 stand rejected as allegedly being obvious over the disclosure of Osumi et al (US6375317) and Katsuragi et al (EP1125994) further in view of Vue et al. (US 6461418), These rejected claims are dependent claims which describe the presence of soluble polymeric binder. Claim 15 has been withdrawn.

As argued for Obviousness Rejection 1, Osumi and Katsuragi do not provide the motivation to combine the ink and fixer described in this application. In fact, the possible combination of Osumi and Katusuragi leads to an inferior results as provided by the

comparative examples in the current application. While Vue provides the addition of acrylic binders to an ink; there is no motivation or suggestion to combine these inks with acrylic binders with a fixer fluid, especially the copper nitrate, copper sulfate, or copper acetate salt fixer fluid of the invention.

The examiner has not provided the motivation or suggestion to combine references, from the combination of Osumi, Katsuragi and Vue that will lead to the unexpected OD results of the inventive ink.

Based on these arguments above Obviousness Rejection 2 should be overcome for claim 3.

Obviousness Rejection 3.

Claims 9, and 20 stand rejected as allegedly being obvious over the disclosure of Osumi et al (US6375317) and Katsuragi et al (EP1125994) further in view of Suzuki et al. (US 6153001). These rejected claims are dependent claims which describe the presence of anionic moieties on the carbon black pigment. Claim 20 has been withdrawn.

The combination of these references does not motivate or suggest the combination described in the invention and especially the unexpected results describe above.

Based on these arguments the Obviousness Rejection 3 should be overcome for claim 9.

As previously stated, the technical problem addressed in the application is to provide both high optical density (OD) and good rub-fastness in an ink set comprising at least one aqueous ink containing a self-dispersed pigment (SDP) colorant, a soluble polymer binder or/and an effective amount of calcium cation and an aqueous fixer fluid comprising a soluble copper nitrate, copper sulfate, or copper acetate salt. As stated in the specification at paragraphs [0010], one of ordinary skill in the art at the time of the invention would have generally expected the addition of polymer binder to improve rub-fastness but decrease OD, presumably because the polymer binder helps shield the pigment from the OD enhancing effect of the fixer. Applicant's, however, have found that from among the infinite number of possible combinations, only a certain cationic

{copper(II)} (nitrate, sulfate or acetate)salt fixer/SDP ink combination with soluble polymer binder and/or a calcium cation present does not experience this negative effect on OD.

It is well established that evidence of unobvious or unexpected advantageous properties, can rebut prima facie obviousness and Examiner must consider such evidence. [MPEP § 716.01 (a) and § 716.02(a)].

Since all of the claims require that the use of a copper nitrate, copper sulfate, or copper acetate salt fixer fluid and the first SDP ink to comprise soluble polymer binder or/and multivalent, namely calcium cation, each is commensurate in scope with the unexpected results shown in the specification.

In conclusion, although the Applicants maintain that the cited references do not set forth even a prima facie case for obviousness and it is respectfully submitted that the evidence here shown of unexpected superior results is compelling and sufficient to rebut any prima facie case of alleged obviousness. In the face of the amended claims and the unexpected results shown in the application, Applicant requests that all rejections made under 35 U.S.C. §103(a) be withdrawn.

Conclusion

In view of the above remarks and newly presented experiments, all rejections are believed to have been successfully traversed and the pending case is otherwise believed to be in condition for allowance. If the Examiner should believe that anything further may be required to place this application in even better form for allowance, Examiner is cordially invited to telephone the undersigned attorney for Applicant.

Respectfully submitted,

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